

2019 U.S. DEPARTMENT OF ENERGY SOLID-STATE LIGHTING R&D WORKSHOP AGENDA

January 29–31, 2019 • Dallas, TX

TUESDAY, JANUARY 29

7:00 a.m. *Registration Opens and Continental Breakfast*

PLENARY SESSIONS

8:00 a.m. **WORKSHOP WELCOME**

8:30 a.m. **PLENARY 1: MATERIALS DESIGN FOR LONG-WAVELENGTH LEDs**

There has been great progress in improving efficiency in blue LEDs the past decade, though long-wavelength LEDs (green, amber, red) have not followed a similar trajectory. New materials design and selection are needed to improve LED emitters over today's efficiency levels. This talk will provide a computational viewpoint on developing new or improved emitter materials with an advanced fundamental understanding of materials-synthesis-performance relationships for LEDs.

CHRIS VAN DE WALLE, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

9:15 a.m. **PLENARY 2: THE PATH FOR OLEDs IN LIGHTING**

The major challenges faced in OLED lighting are stable blue emitters, efficient light extraction and cost reduction. This talk will discuss whether these challenges can be met through extensions of current R&D or whether radically new approaches are needed.

STEVE FORREST, UNIVERSITY OF MICHIGAN

10:00 a.m. *Refreshment Break*

TRACK DISCUSSIONS

10:30 a.m. **LED TRACK DISCUSSION I: CHIP AND MATERIALS**

Expert panel leads technical discussion on LED chip and materials advances.

MODERATOR: MONICA HANSEN, LED LIGHTING ADVISORS

DANIELLE CHAMBERLIN, LUMILEDS

BERTHOLD HAHN, OSRAM OPTO SEMICONDUCTORS

JUANITA KURTIN, OSRAM OPTO SEMICONDUCTORS

JIM SPECK, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

OLED TRACK DISCUSSION I: MATERIALS AND STACK

Expert panel leads technical discussion on OLED materials and stack advances.

MODERATOR: LISA PATTISON, SSLS, INC.

CHRISTIAN KASPAREK, CYNORA

BERNARD KIPPELEN, GEORGIA TECH

MARK THOMPSON, UNIVERSITY OF SOUTHERN CALIFORNIA

Noon

Lunch

TRACK DISCUSSIONS

1:00 p.m.

LED TRACK DISCUSSION II: NEW DIRECTIONS IN LUMINANCE AND OPTICAL BEAM CONTROL

Expert panel leads technical discussion on new directions and emerging needs in LED luminance and optical beam control.

MODERATOR: JEFF TSAO, SANDIA NATIONAL LABORATORIES

WOUTER SOER, LUMILEDS

JON WIERER, LEHIGH UNIVERSITY

ANDY ARMSTRONG, SANDIA NATIONAL LABORATORIES

OLED TRACK DISCUSSION II: LIGHT EXTRACTION

Expert panel leads technical discussion on advances in OLED light extraction.

MODERATOR: LISA PATTISON, SSLS, INC.

STEVE FORREST, UNIVERSITY OF MICHIGAN

SELINA MONICKAM, PIXELLIGENT

FRANKY SO, NORTH CAROLINA STATE UNIVERSITY

2:30 p.m.

Refreshment Break

3:00–5:00 p.m. **POSTER SESSION**

Project posters will be presented by research team representatives, providing an opportunity for one-on-one discussions with SSL's leading scientists.

Columbia University

Electroninks

Georgia Institute of Technology

Hazen Research

InnoSense

Lucent Optics

Lumenari

Lumileds

Luminit

Lumisyn

National Renewable Energy Laboratory

North Carolina State University

OLEDWorks

Penn State University

PhosphorTech

Pixelligent

RTI International

Sandia National Laboratories

Sinovia Technologies

Solution Deposition Systems

South Dakota School of Mines and Technology

Tetramer Technologies

University of California, Santa Barbara

University of Michigan

University of Southern California

Virginia Tech

STUDENT POSTER COMPETITION WINNERS

Caicai Zhang, University of Central Florida

Ya Zhuo, University of Houston

WEDNESDAY, JANUARY 30

7:00 a.m. *Continental Breakfast*

PLENARY SESSIONS

8:00 a.m. **PLENARY 3: TRENDS IN LIGHTING TECHNOLOGY AND APPLICATIONS**

LEDVANCE is a leading global supplier of LED lighting products, selling a wide range of lamps, luminaires and smart lighting systems in over 140 countries. This talk will outline the challenges in the transformation of the global lighting industry and identify R&D opportunities to increase the benefits of solid-state lighting.

LAWRENCE LIN, LEDVANCE

8:45 a.m. **PLENARY 4: INNOVATIONS IN SOLID-STATE LIGHTING**

The pace of innovation in today's lighting industry shows no sign of slowing. New products with advanced features continue to broaden the appeal and energy-saving impact of SSL. As LED efficiencies continue to climb, other features including quality of light, unique spectrums, and light density continue to be important research areas. Beyond the performance levels, the lifetime of LEDs and system quality will be discussed.

ERIK SWENSON, NICHIA

9:30 a.m. *Refreshment Break*

10:00 a.m. **PANEL 1: NEW DIRECTIONS IN RELIABILITY AND STANDARDS**

New directions in LED technology – including tunable sources and new applications – combined with the use of OLEDs have resulted in new considerations for SSL reliability. This panel will cover new elements of SSL system reliability and updates to previous considerations.

MODERATOR: MORGAN PATTISON, SSLS, INC.

ERIC BRETSCHNEIDER, EB DESIGNS AND TECHNOLOGY

JIM GAINES, SIGNIFY

LYNN DAVIS, RTI INTERNATIONAL

CAMERON MILLER, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

11:30 a.m. *Lunch*

TRACK DISCUSSIONS

12:30 p.m.

LED TRACK DISCUSSION III: LUMINAIRE CONCEPTS

Expert panel leads technical discussion on advances in LED luminaire concepts.

MODERATOR: MONICA HANSEN, LED LIGHTING ADVISORS

MICHAEL GODWIN, OSRAM OPTO SEMICONDUCTORS

WENDY LUEDTKE, ETC

STEVE PAOLINI, TEELUMEN

PAUL PICKARD, ECOSENSE LIGHTING

OLED TRACK DISCUSSION III: INTEGRATED SUBSTRATES

Expert panel leads technical discussion on advances in OLED integrated substrates.

MODERATOR: NORMAN BARDSLEY, BARDSLEY CONSULTING

WHITNEY GAYNOR, SINOVIA TECHNOLOGIES

JEFF SPINDLER, OLEDWORKS

SPEAKER TBA. SUNDEW TECHNOLOGIES

2:00 p.m.

Refreshment Break

2:30 p.m.

LED TRACK DISCUSSION IV: LUMINAIRE CONCEPTS (continued)

A second expert panel continues technical discussion on advances in LED luminaire concepts.

MODERATOR: MORGAN PATTISON, SSLS, INC.

PETER KOZODOY, GLINT PHOTONICS

MARCELO SCHUPBACH, WOLFSPEED

SPEAKER TBA, LEDVANCE

SPEAKER TBA

OLED TRACK DISCUSSION IV: ENCAPSULATION AND BACK-END PROCESSES

Expert panel leads technical discussion on advances in OLED encapsulation and back-end processes.

MODERATOR: NORMAN BARDSLEY, BARDSLEY CONSULTING

MICHAEL BOROSON, OLEDWORKS

OFER SNEH, SUNDEW TECHNOLOGIES

SPEAKER TBA

OPEN DISCUSSIONS AND Q&A

4:30 p.m.

Rump sessions enable open discussion and Q&A on multiple lighting science topics of the day.

6:00 p.m.

Adjourn

THURSDAY, JANUARY 31

7:00 a.m. Continental Breakfast

PLENARY SESSIONS

8:00 a.m. **PLENARY TALK 5: DESIGNING LED LIGHTING SOLUTIONS FOR NEW APPLICATIONS**

LEDs are enabling entirely new lighting applications, which require entirely new designs that employ the latest lighting science. This talk will examine the process of developing an efficient lighting solution for an entirely new application. Considerations include spectrum, optical distribution, intensity, reliability, and cost. Application barriers and R&D opportunities will also be covered.

ROGER BUELOW, AEROFARMS

8:30 a.m. **PANEL 2: RETHINKING LIGHTING APPLICATION EFFICIENCY**

This expert panel will consider the efficiency of the holistic lighting system, including optical delivery efficiency, spectral efficiency, intensity suitability, and source efficiency. Participants will discuss a new methodology to evaluate trade-offs between all elements of lighting application efficiency.

MODERATOR: JEFF TSAO, SANDIA NATIONAL LABORATORIES

KEVIN HOUSER, PENN STATE UNIVERSITY

ROBERT SOLER, BIOS LIGHTING

SPEAKER TBA

10:00 a.m. Refreshment Break

10:30 a.m. **PANEL 3: EFFICACY AND SAFETY WITH SSL**

A better understanding of the safety impacts of lighting will enable development of lighting solutions that are both safe and efficient. This panel will discuss how lighting affects safety and where more research is needed.

MODERATOR: MONICA HANSEN, LED LIGHTING ADVISORS

JOE CHEUNG, U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

MAX MARTELL, CENTERS FOR DISEASE CONTROL

DON MCLEAN, DMD & ASSOCIATES

Noon Lunch

PLENARY SESSIONS

1:00 p.m.

PANEL 4: UNDERSTANDING AND DESIGNING EFFICIENT LIGHTING FOR VISION AND WELL-BEING

Part 1 of this discussion will examine generally agreed upon scientific findings related to light and vision interaction and explore yet unknown aspects. Part 2 will examine the challenges in engineering lighting systems for vision and well-being. These systems can be complicated and costly, and often show unclear results. The session will discuss the challenges, best practices, energy impacts, and what future research is needed to ensure lighting is optimized for both health and energy efficiency.

MODERATOR: ROBERT DAVIS, PACIFIC NORTHWEST NATIONAL LABORATORY

SHADAB RAHMAN, HARVARD MEDICAL SCHOOL

DAVID SLINNEY, INDEPENDENT CONSULTANT

RON GIBBONS, VIRGINIA TECH TRANSPORTATION INSTITUTE

GENA GLICKMAN, UNIVERSITY OF CALIFORNIA, SAN DIEGO

BRIAN LIEBEL, ILLUMINATING ENGINEERING SOCIETY

3:30 p.m.

Adjourn